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N. A. C. A. BULLETIN

Vol. XXI, No. 7 December 1, 1939

IN TWO SECTIONS

Section I

IN THIS ISSUE

Standard Costs for the Pioneer Crayon Manufacturing Company, by Arthur C. Chubbuck and Clarence B. Nickerson 423

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EDITORIAL DEPARTMENT NOTE

There are very few N.A.C.A. members connected with companies manufacturing crayons and chalk. But there are many members who are operating standard cost systems, often in relatively small companies such as the one described in this article. We feel that these members, together with the great bulk of our membership who are interested in standard costs, will find the case study in this issue of real interest. The value of case study material lies not so much in the information provided on the particular industry which is discussed, but in the opportunity provided for illustrating the practical application of cost accounting principles by relating them to a particular company. "Standard Costs for the Pioneer Crayon Company" is a good illustration of the information which can be conveyed by this type of treatment.

The joint authors of this article are Arthur C. Chubbuck and Clarence B. Nickerson, both members of the Boston Chapter. For the past 18 years Mr. Chubbuck has been connected with the Boston office of Patterson, Teele & Dennis, and during this period has had a well-rounded experience in professional accounting, dealing extensively with costs and constructive accounting as well as machine installations. He is a Past President of the Boston Chapter and at the Atlantic City Convention last June served as Chairman of the group discussion of "Plant Accounting and Depreciation Policies." Professor Nickerson graduated from the College of Business Administration of Boston University in 1928 and from the Harvard Graduate School of Business Administration in 1930. Following graduation he joined the accounting department of the Harvard Graduate School to engage in research in the field of accounting and to aid in the development of case material for teaching purposes. He is now an Assistant Professor of Accounting at Harvard. Both Mr. Chubbuck and Professor Nickerson have previously contributed to the *Bulletin*.

Articles published in the *Bulletin* present many different viewpoints. In publishing them the Association is not sponsoring the views expressed, but is endeavoring to provide for its members material which will be helpful and stimulating. Constructive comments are welcomed and will be published in the Forum Section of the *Bulletin*.

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COST ACCOUNTANTS

DECEMBER 1, 1939

STANDARD COSTS FOR THE PIONEER CRAYON MANUFACTURING COMPANY

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AT THE end of a side street in a certain small city stands the factory of the Pioneer Crayon Manufacturing Company, manufacturers of wax crayons and chalk. The building is rather old and it is quite apparent that extensions and additions have been made from time to time in line with the growth of the business. For these reasons the company does not have the ideal plant layout that would be possible in a more modern structure.

Before proceeding with a description of the plant layout and the production processes, it may be well to indicate more specifically the types of product made by this company, of which there are some 500 items.

Products

Wax crayon and chalk are the generic terms of the output, but there are considerable variations in size, color, quality, utility and type of package. For example, crayons for children are manufactured in a wide range of sizes, colors, and qualities and are packed in boxes of different sizes and shapes involving differences in quantity and color range and arrangement within the box. Other crayons of superior quality are made for professional use. Again, a variety of crayons are made for special purposes, such as for marking on leather, on wood, and on glass.

Chalk is of two general types, one being known as dustless and the other as just plain chalk. The bulk of the production of chalk is for school and lecture purposes. There are variations in quality and part of the output is in a rather extensive range of colors. There are also special purpose chalks such as the blue colored chalk used by carpenters.

The products lend themselves to small scale operation, and although competition is keen in the industry, the producers are all very small compared to producers in major industries.

The many variations in product and package raise problems in production methods, planning and control, inventory control and valuation, cost accounting and cost allocation, wage payment, pricing and selling. In particular the problems of production, accounting, pricing and selling differ as between standard lines produced in relatively large volume and special items or items produced and sold in small lots.

It should be stated that as one step in the improvement of its position, the company within recent years has achieved some simplification in its line of products. This matter has to be subjected to periodic review, however, because there is constant pressure to increase the line in meeting the particular requirements of individual customers. Not infrequently the demands of customers in this respect are unreasonable and full discussion with the customer as to his real needs may reveal that a stock item will give perfect satisfaction.

Production Process and Plant Layout

The production process is very simple for both crayon and chalk, and it is possible to discuss the process and plant layout at the same time, together with certain implications involving production and accounting problems.

Looking now at the plan of the basement as shown in Exhibit 1A on page 426 we note that a certain amount of space is taken up in the storage of packing materials. There is also considerable unused space which, however, in its present condition as to light, air, etc., does not lend itself to anything other than storage. While we are on the point of unused space it might be well to indicate that, in general, throughout the plant there is room for the expansion of production facilities without increasing the size of the building, though certain adjustments would be necessary.

The space marked "Raw Material" in the basement, is the area in which raw materials are stored, and here also materials are weighed and put together in response to production orders and in accordance with established formulas.

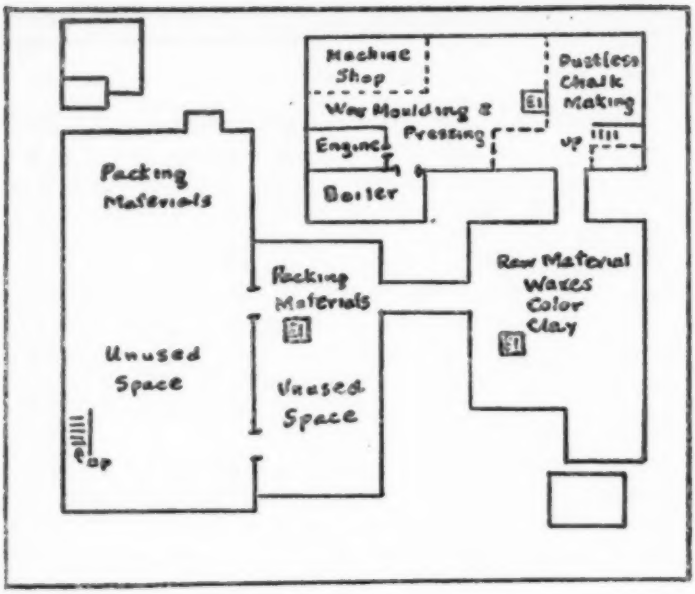
Crayons

Materials for wax crayons consist of various grades of paraffin, canawba wax (a vegetable wax from a certain type of palm), stearic acid and coloring materials. The stearic acid strengthens the crayon and sharpens its melting point. The company's formulas have been prepared with care and they must be followed specifically in order that a given crayon will be best fitted for the purpose for which it is to be used; so that the color and quality will be correct; and so that it will be neither too brittle when cold nor too soft when warm. Periodically the formulas are restudied with the double purpose of improvement of product and lowering of cost. In this same connection the company is ever watchful for new materials and new sources of supply.

When the wax and other material is assembled for a given lot of crayon it is sent in a box to the moulding department, also shown in the basement plan. Here it is dumped into a steam jacketed kettle, of which there are a number, and melted. When properly melted and mixed it is removed from the kettle by means of hand dippers and poured into a mould. There are two kinds of moulds, one called a hand mould which is similar to an old fashioned candle mould except that it is water jacketed to speed cooling and consequent hardening of the crayons, and another called a machine mould which is also water jacketed and of much larger capacity. The hand moulds are pulled apart to remove the crayons and are used for the larger and special types of crayons. Machine moulds are used for the bulk of the production. In these moulds when the crayons have been sufficiently hardened, excess material is scraped off and put back into the kettle and the turning of a wheel forces plungers up through the bottom of the mould, one plunger for each crayon, which cause the crayons to rise from the mould to the point where they can be removed by hand and placed in racks.

Before we leave the basement it might be well to describe the processes for two other types of product made in the moulding room. Pressed crayons of high quality for professional use are made here by mixing materials in steam packeted mixers until they are reduced to a plastic state after which the plastic is forced through a die and cut off at the desired length. These crayons are

Basement



Second Floor

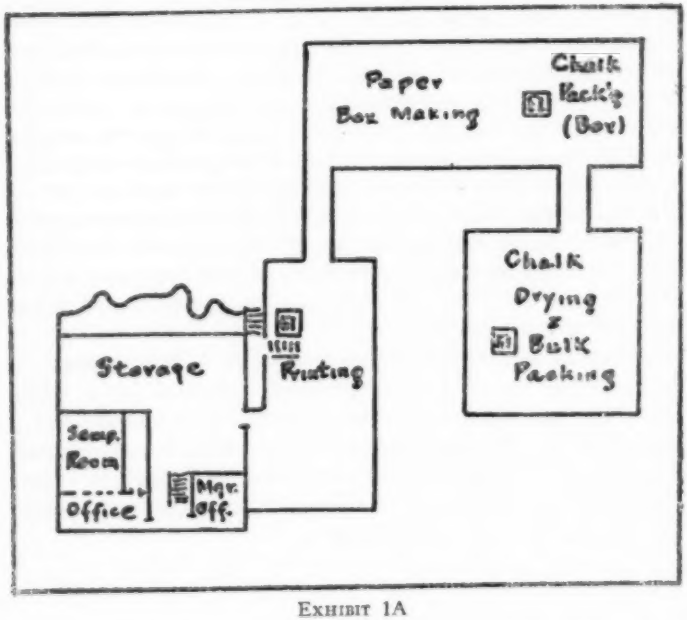
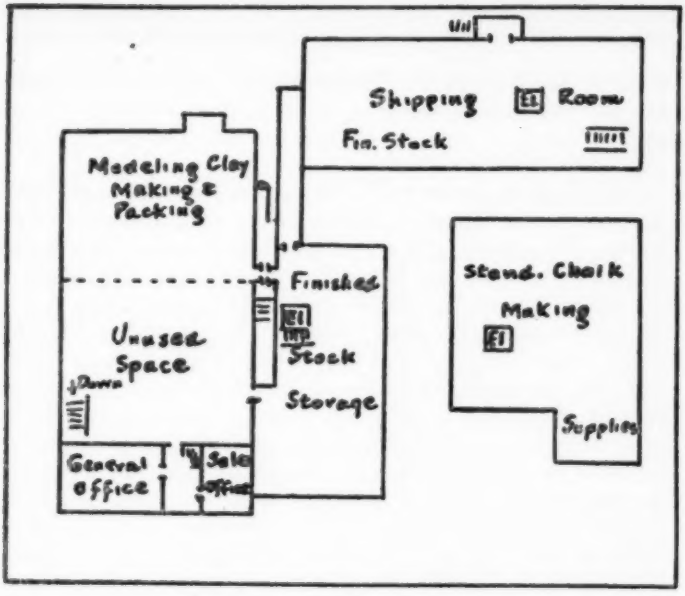


EXHIBIT 1A

First Floor



Third Floor

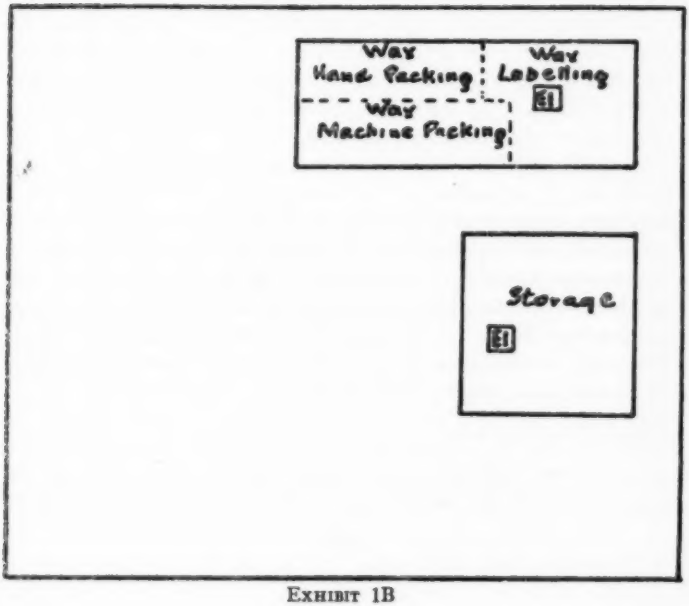


EXHIBIT 1B

allowed to harden and are then pointed by being inserted individually in a pointing machine.

Dustless Chalks

The remaining product of this department is dustless chalk which is made of English chalk, tapioca flour, soap, Japan wax, and water. The tapioca flour serves as a binder, while the soap and wax keep down the dust when the chalk is in use. The materials are mixed in a manner similar to that for pressed crayons, and likewise the mixture is forced through a die. Instead of being cut at this stage, however, the chalk is laid in strips in grooved racks and after hardening the racks are pushed under a row of small circular saws which cut the chalk to proper length. Any scrap or broken chalk can be ground up and re-worked.

Before leaving the moulding department it should be stated that the basement in which it is located is for the most part above ground; is on a higher level than the basements of the remaining buildings; and has ample windows. Because it is on a different level materials must be brought up to it from the basement in which the raw materials are kept. Looking at the second floor plan for a minute, you may note that the chalk bulk packing department, though located on the second floor, is in fact on about the same level as the moulding department. On the second floor plan the chalk drying department shows a passageway that leads in fact to the chalk packing department on the second floor of the building in the upper right of the second floor plan.

In summary, with respect to the moulding department we have noted that the processes are not complicated, the machinery is not elaborate, and considering the quantity of crayon and chalk produced, the building space used is very small. Materials are simple, relatively inexpensive, and net waste is hardly visible since all materials can be re-worked. Labor cost per unit of product is higher for pressed crayon and dustless chalk than for moulded crayon. Also, hand moulding of crayons involves more labor cost per unit of product than does machine moulding.

Printing and Labeling

Let us now walk up to the second floor to see the printing and paper box making departments. The company prints all of its

labels, and prints and makes most of its paper boxes in which crayons are packed. This is of particular advantage in meeting quickly the special label and box requirements of customers. The printing department looks like any other small printing shop though in neatness it is probably ahead of many others. Paper boxes are made in large quantities by machine and in small lots by hand. The major operations are creasing, folding and glueing.

Proceeding now to the third floor we come to the wax labeling department. Here we find quite a sizable store of wax crayons in racks as they have come from the moulding department. A supply at this point facilitates production in economical lots in the moulding department, is an aid in quickly meeting sales requirements, and also enables the labeling and packaging departments to plan their work without dependence upon current production coming from the moulding department.

Labeling is a simple operation in which a crayon is rolled in a label to which an adhesive has been applied. Most of the labeling is performed by machine but small lots and special crayons are rolled by hand.

There is always some inventory of labeled crayons awaiting packaging which is an aid in overcoming the immediate dependence of the packing department upon the labeling department. It should also be stated that some of the employees are adept at both labeling and packing and can be assigned to whichever work is most urgent at any given time.

Packing

Packing is performed both by machine and by hand, the choice between the two being determined by the size of the lot and the type of package. Small lots, special crayons and odd packages require hand picking and certain bulk shipments are also packed by hand. Much of the packing, however, is performed by ingenious machines which provide automatically the same assortment of colors for each box being packed on a given run. After packing, the boxes of crayons are moved to finished stock storage where they may stay for some time or may be removed immediately, packed in shipping boxes, and shipped to customers. In other words, some of the production is for stock and some on order.

When an order is received from a customer, an invoice is prepared and at the same time other copies are made by means of carbon paper. Two of these are sent to the shipping department, one of which is retained by the shipper and the other is returned to the office when the goods are shipped. If the goods called for are not in stock, the shipper notifies the factory manager, who in turn starts a production order through the plant. Many of the orders can be filled from stock and the control of stock is also a responsibility of the shipper, though the factory manager keeps in touch with both sales and inventory and builds up stock when it appears desirable to do so. The production planning is in fact less formal than would be the case in a larger organization. The factory manager is in constant touch with the general manager, who in turn watches both sales and production. The supervisors of departments watch the inventories in their departments and co-operate in planning production. The plans must not only take into account the quantity of stock on hand and the present and prospective sales, but must also be designed to keep the employees supplied with work, and to have equitable allotment of work between employees.

Upon the return of the copy of the invoice from the shipping department, the office sends the original invoice to the customer. The copy received from the shipping department is then filed with the original order from the customer, and this file constitutes the accounts receivable ledger. Of the remaining copies of the invoice, one is used by the office for analysis work and the others are sent to the sales department.

Standard Chalk

Let us now go down to the standard chalk-making department on the first floor. Here plaster of Paris, plus coloring materials when colored chalk is being made, is mixed with water a batch at a time and the mixture is poured by hand into moulds where it sets rather quickly. Each employee mixes his own materials and keeps several moulds in operation. This involves careful timing since materials must be poured soon after mixing, or else they will set, and for the same reason, excess material must be removed soon after pouring. When the chalk has set, a mould is broken down and the chalk emptied into a tray. The mould is then cleaned and

put together in readiness for another batch. Some of the employees have developed a real rhythm in their work and swing from one operation to another with no lost motion.

The trays containing chalk are piled on hand trucks and carried by elevator to the third floor where they are placed in drying rooms, the temperature there being about 150 degrees. Drying both removes moisture and hardens the product. After drying, the trucks are removed and either sent down by elevator to the second floor where chalk is packed in bulk, or are wheeled to the second floor of another building (upper right corner of second floor plan) for packing in boxes. All packing is performed by hand.

In addition to crayons and chalk the company also prepares and packages modeling clay, but since this is only a minor part of the total output we shall omit discussion of the process by which it is made.

Organization

Turning now to the matter of organization, we can see by the chart (Exhibit 2) that this is very simple. The general manager is also the treasurer and is in active charge of all operations. The company is small enough so that, in addition to accounting controls and control by holding subordinates to definite duties and responsibilities, he can maintain a visual control over operations. He knows every employee well and calls them all by their first names. The employees are all native stock and most of them have been with the company for many years. They are co-operative in the matter of wage adjustments under changing conditions and the management takes a keen interest in their problems. We do not wish to imply too much in speaking of this friendly relationship between employer and employee, but we can say that this is not a plant in which we would expect to find a sit-down strike.

The factory manager is in direct charge of production and does quite a bit of developmental work. Much of the ingenious machinery and many of the time and labor-saving operations in the plant have been developed by him.

The supervisors have all been with the company for many years and they not only supervise the work of their departments but also do their share of the work. They are skilled in all of the operations

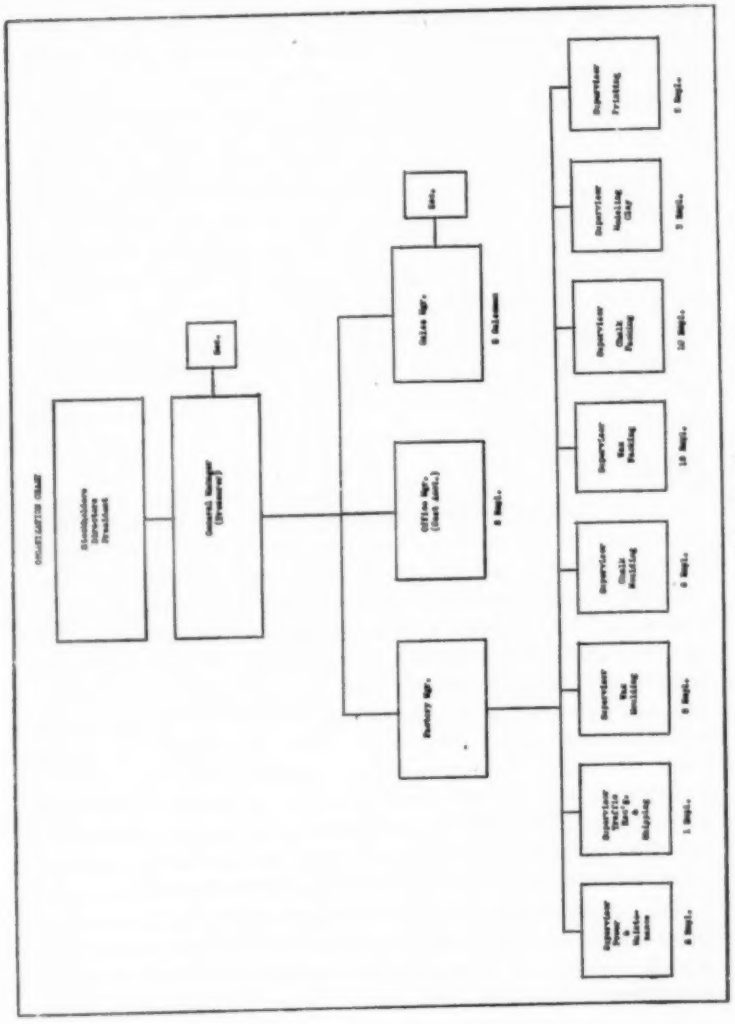


EXHIBIT 2

called for within their departments and can shift from one operation to another in line with immediate production requirements.

Summary of Plant, Products and Processes

In summary at this point, we have tried to present a picture of the physical aspects of the plant, the products and the processes. We have noted that the plant is rather old and has grown by various stages in line with the growth of sales over the years. The result is that the company does not enjoy the ideal plant layout that would be possible in a more modern structure. There is considerable moving of materials up and down and back and forth which cannot be avoided under the present layout. It is doubtful whether the major changes that would be necessary to correct this condition could be justified by the possible savings except over a good many years.

We have noted that the products are in some sense rather simple, but variations in size, quality, utility, color and package create problems in purchasing, development of formulas, planning, production, accounting, wage payment, inventory control and valuation, pricing and selling.

The company is small enough so that the management can keep in active touch with all operations and can exercise visual control. In addition to this there have been developed over the years various accounting controls, including standard costs, and we shall now proceed to describe the cost accounting and accounting controls used by this company.

Our study is not that of a company sailing the seven seas of business without a chart or compass. It is rather that of a company equipped with such necessary instruments that the course of the company is well indicated and warning of submerged menaces is received in due time to avoid disaster. The Pioneer Crayon Manufacturing Co. has been so equipped for several years. Growing familiarity with the use of the devices at its command has been accompanied by increasing regard for and dependence upon them.

Our general observation of the indicating and measuring devices which the company uses is that they are plain, substantial, reliable and economically operated. It is possible that certain adjustments may be made to advantage and another instrument or so

EXHIBIT 2

may be added to measure variation and simplify interpretation of the course we are sailing.

Perspective of Case through General Financial Statements

The statement of profit and loss, the balance sheet and the chart of accounts, whatever the size or nature of a business, indicate to the reader the general character of the business, its management and its accounting. It is to them that we refer you first in order that you may get such further perspective of the case as circumstances permit. For obvious reasons, we are not in a position to give actual figures in these statements, so no figures have been provided, but the general form and the nature of the information provided is quite clearly indicated in Exhibits 3, 4 and 5 The chart of accounts is extremely simple and implies quite clearly that much of the detail appearing in the statements will be produced statistically.

The statements, with certain others subordinate thereto, although they are in the hands of management each month, are historical and review the course we have sailed to the point where financially we arrive at the end of the month just passed. The degrees of variation, by comparison with certain standards we have established for our course, are set forth for the future guidance of management. Devices for minimizing the unfavorable variations day by day will be commented upon later in our examination.

We may now view in turn certain methods and other measures of operation used by this company, and gradually work back to this matter of financial statements.

Standard Operating Plan

The first thing that attracts our attention is evidence that the Pioneer Crayon Manufacturing Co. has given thought to a general plan of operation. This evidence consists of a simple graphic chart of the cross-over variety which portrays the reasonably expected (or perhaps hoped for) net operating results at different levels of plant activity. This chart is of the usual type, and for that reason it is not included with the exhibits. This graphic chart is premised on a sales volume line which reflects standard prices and discounts

CHART OF ACCOUNTS

Balance Sheet

Current Assets:
- Cash
- Petty Cash
- Accounts Receivable
- Reserve for Bad Debts
- Raw Materials:
  - Wax
  - Clay
  - Color
  - Etc
- Work in Process
  - Materials, Labor and Burden
- Finished Goods

Fixed Assets:
- Land
- Buildings
- Machinery—Manufacturing
- Machinery—Printing
- Equipment
- Autos
- Furniture and Fixtures
- Reserves for Depreciation

Deferred Assets:
- Prepaid Insurance

Current Liabilities:
- Vouchers Payable
- Notes Payable
- Accrued Items

Capital Stock:

Surplus

Profit and Loss

Sales:
- Sales Allowances
- Sales Returns

Cost of Sales

Manufacturing Variances:
- Materials
- Labor
- Burden
- Printing

Manufacturing Expenses:
- Superintendent
- Supervision
- Indirect Labor
- Fuel
- Purchased Power
- Water
- Supplies
- Freight in
- Repairs
- Experimental Expense
- Electros
- Taxes
- Insurance
- Depreciation

Selling and General Expenses:
- Salaries—Executives
- Salaries—Sales
- Salaries—General
- Commissions
- Advertising
- Traveling
- Telephone and Telegraph
- Freight
- Collections
- Bad Debts
- Postage
- Stationery and Supplies
- Professional Services
- General

Other Income:
- Interest
- Discounts

Exhibit 3

BALANCE SHEET

.....193

ASSETS	Current Date	Change from Last Month	Change from Close of Last Year
Cash			
Accounts Receivable—Customers			
—Personal			
TOTAL			
Less: Reserve for Bad Debts			
Notes Receivable			
Inventory—Raw Materials			
—Process			
—Finished			
TOTAL CURRENT ASSETS			
	Book Value	Res. for Deprec.	
Land and Buildings			
Machinery			
Equipment			
Truck			
Furn. and Fixtures			
TOTAL CAPITAL ASSETS			
Deferred Charges			
TOTAL ASSETS			
LIABILITIES			
Vouchers Payable			
Notes Payable			
Accrued Liabilities			
Reserve for Federal Taxes			
TOTAL CURRENT LIABILITIES			
Stockholders' Equity			
Capital Stock—Preferred			
2nd Preferred			
Common			
Surplus			
Total Stockholders' Equity			
TOTAL LIABILITIES AND CAPITAL			

EXHIBIT 4

PROFIT AND LOSS STATEMENT

For the Month of 193

		Total	*Wax Crayon*	*Dustless Chalk*	*Chalk*	*Modeline*
1	Sales					
	Allowances					
	Net Sales					
2	Cost of Sales—Standard Basis					
	Gross Profit or Loss—Standard Basis					
	Add or Deduct					
	Adjustment of Standard Costs:					
3	Idle Machinery and Space					
4	Materials—Overabsorbed or Unabsorbed					
5	Productive Labor—Overabsorbed or Unabsorbed					
6	Mfg. Overhead—Overabsorbed or Unabsorbed					
7	Printing—Overabsorbed or Unabsorbed					
8	Inventory Adjustments					
	Net Adjustment of Standard Costs					
	Gross Profit or Loss—Actual					
	Deduct:					
9	Selling and Administrative Expenses and Other Charges (Net)					
	Net Profit or Loss (Before Federal Income Tax)					
10	Accrued Federal Income Tax (Estimated)					
	Net Profit or Loss (After Taxes)					

EXHIBIT 5

and such a combination of staple and specialty merchandise that at the level of assumed normal operation the company's plant facilities are effectively used.

The elements of material and labor are graphically presented at standard formula cost, while variable and fixed manufacturing burden and variable and fixed selling and general expenses are presented at budgeted amounts considered applicable in the light of general experience. The facts, then, upon which this chart is based are reasonable, and considering the nature of the business, the chart affords management a broad general picture of desired and possible operating results without the necessity for frequent change in the picture.

Cost Standards

We observe further evidence of planning in the carefully developed standards for each product which the Company uses as a guide in manufacture and in sales.

The number of minutes necessary to manufacture a gross of product under normal conditions has been developed through careful studies of equipment and operations. The number of pounds or ounces of materials in the formula for each product has also been worked out scientifically. The objectives of factory management and of departmental factory heads are to keep within these standards and maintain quality.

For accounting and general management purposes, price factors are applied to these standard quantities of labor and material. Manufacturing expenses are included on a reasonable basis accepted as standard. The result is standard costs, or costs which the company uses as a yardstick with which to measure its actual costs of operation, to price its inventories other than raw materials, and as a basis for establishing sales prices of new products. You have probably inferred from your hurried glance at the profit and loss statement that differences between standard cost and actual cost are charged against operating results in the month in which they occur. That is correct.

How often in this case are the standard costs changed? The answer is "not frequently." Change of formula or change in production method result, obviously, in a change in standard and in standard cost.

What may be accepted for the time as a standard price for a commodity may get so far afield from actual fact that a change may be made on this account also. It is a simple matter, however, when close figuring is necessary, to give effect to a change in a commodity price or a labor price factor in a standard cost without changing the standard cost sheet, so that the necessity for changes in the standard costs are infrequent indeed.

In the event of a change in standard costs resulting from change in methods or prices, the prices of similar products in inventory are adjusted accordingly and the difference is shown in an inventory adjustment item which may or may not be taken at once into current operating results, depending upon the direction of the change.

It may be interesting to examine more closely how standard costs for material, labor and burden have been developed and utilized.

Material

Standards for the raw material element of the company's product are the result of much arduous work and chemical research.

Desirable and necessary characteristics of wax crayons, having due regard for the price and the quality are: (1) depth of color; (2) sharpness of melting point, that is a minimum of softening before transition to the liquid state; (3) ability, on the one hand, to remain a solid under extreme summer temperature and, on the other hand, to avoid glass brittleness under extreme winter temperature; and (4) ability to perform their function without flaking or depositing material too plentifully. To obtain these characteristics consistently requires a variety of waxes and other materials which must be combined carefully.

Chalk presents less of an exact production problem, although this statement is merely comparative, for the qualities of proper tensile strength and comparative freedom from dust seem at times to be extremely elusive.

Barring error in formula, there is very little loss of materials in wax crayon production, since broken crayons are merely returned to the kettle. Salvage of the materials in defective chalk crayons is accomplished through regrinding in the case of standard chalk and through return to the mixers in the case of dustless

chalk. Allowances for a very small normal loss of materials are made in figuring the standard formula cost, but any losses occurring in excess of the standard are a part of materials variance.

Inasmuch as materials for both the wax crayons and the chalk crayons are issued on the authority of a production order and according to the prescribed formula, unidentified materials quantity variance is negligible. Materials issued because of spoilage are in all cases supposedly specially authorized so that such variance is easily identified.

The accounting for materials is simple. Major divisions of raw materials each have a general ledger account to which all purchases are charged as indicated in Exhibit 3. Each month a physical inventory is taken of the raw materials on hand, and materials consumed is calculated. The actual quantities of each class of raw materials used during the month, priced in effect at actual cost on the first-in, first-out basis, are added to the work-in-process account balances at the beginning of the month. (See Exhibit 6.) The accounting affecting the departmental work in process is statistical, the total only being carried into the inventory accounts.

From the totals so produced, there are deducted with respect to each class of material, the standard cost value of the materials in products finished during the month, plus the standard value of the materials remaining in process at the end of the month.

The total differences is materials variance for the month, identifiable according to class of materials as shown on Exhibit 6 and further identifiable as between price variance and quantity or usage variance.

In further explanation of Exhibit 6, the first column represents the actual materials in process at the beginning of the month priced at standard cost. The second column is for the actual cost of materials put into process during the month. For any given material this figure is found by adding purchases to the beginning raw material inventory and subtracting the ending inventory of raw material. (The quantity of ending inventory is established by physical count and priced by working back on the most recent invoices.) The third column is the total of the first two columns. The fourth column represents materials in products finished dur-

ADJUSTMENT OF STANDARD COSTS FOR MATERIALS

for the month of.....193

BY CLASSES OF MATERIALS

Classification	*Materials in Process Beginning of Month—Actual*	*Materials Put in Process—Actual*	*Total*	*Materials Consumed in Production—Standard Basis*	*Materials in Process End of Month—Standard Basis*	*Materials in Process End of Month—Actual*	*Standard Over or Under i. e. Materials Overabsorbed or Unabsorbed*
Wax							
Color—Dry							
do —Pulp							
Clay and Plaster							
Wax Boxes							
Chalk Boxes							
Shipping Boxes—Wood							
do —Corrugated							
Modeline							
TOTAL							

BY DEPARTMENTS

Department							
Wax Crayon							
Dustless Chalk							
Chalk							
Modeline							
TOTAL							

EXHIBIT 6

ing the period priced at standard cost. The fifth column is the difference between columns three and four, and as the residual it represents the value of the ending inventory, together with all materials price and quantity variances between actual and standard for the month. Column six represents the actual quantity of work in process at the end of the month established by physical count and priced at standard cost. Column seven is the difference between columns five and six.

Another materials variance which is of importance at times is that which measures the difference between the cost of the materials consumed and the market value of the materials at the time they are put into process; in other words, gain or loss due to purchasing on contracts.

This materials variance under the Pioneer Crayon Manufacturing Company's method of accounting for materials is obviously obtainable only statistically. It is of importance in this case, in view of the purchase of waxes and other raw materials on long-term contracts when apparent market conditions appear to justify the practice, and the value of the information as to the prudence of such purchasing and the factor which the profit or loss on such purchasing may be in the total net operating result.

Labor

In the case of labor standards, we find that practically every direct labor operation has been time studied and standards set in terms of an allowance in minutes per gross. Workers are paid at an hourly rate for the greater of the two amounts—elapsed time or allowed time. No separate allowance is made for change over from one color to another, a factor which in wax moulding particularly may be a considerable one. This factor, however, has been recognized in establishing the allowances and standards for operations, by basing the standard on what at the time was an average-sized run and average conditions. Practically, this makes for accounting simplicity, although it is possible that such an arrangement may work an injustice on the operator unless fairness is exercised in giving out work.

It is, of course, in the manufacturing departments that the real control over cost elements is exercised, for it is here that history

finally recorded in the periodical operating statements, is really made. Supervisors appreciate that the operating history for which they are responsible is intimately associated with their future, even though generally, their compensation is not connected directly with the Company's incentive plan.

Conditions that may give rise to labor efficiency variances are poor materials, waiting for work, small lots and new formulae. In fact, as you have probably inferred, any condition which fails to result at the end of the day in total allowed time equalling or exceeding the elapsed time, results in a variance of this nature.

Production is closely supervised and planned so that most labor efficiency variances prove to result from new products not yet properly standardized. Daily reports of production are prepared by the departmental supervisors and after scrutiny by the superintendent, pass to the accounting department. Here payrolls are prepared and considerable work of a statistical nature is performed, all of which ties into the general books through a few major controlling accounts.

Such daily departmental reports show the quantities produced of each item, and the standard allowance and extension. Waiting time is recorded on the report and the reason therefor, such as machine breakdown or awaiting work. The earned minutes, i.e., the extensions of quantities produced and the standard allowed minutes are totalled and compared with the elapsed minutes indicated by the time clock card. As previously mentioned, the operator's pay for the week is computed by applying the hourly rate to whichever is greater, the weekly total of the earned minutes or the elapsed minutes. Labor efficiency variance occurs, of course, when an operator fails to attain standard for the week and is paid on an elapsed minutes basis.

We have seen that the variance arising from labor efficiency or rather inefficiency, is traceable to employee and to item, and is, therefore, subject to control.

Labor variances lesser in amount and significance, arising from difference in labor rate paid by comparison with standard labor rate, together with variances arising from other causes such as losses due to breakage of crayons in transit between departments, are determined by process of elimination.

Reference to Exhibit 7 tends to clarify the method. Work in process is physically inventoried at the month-end according to departments and priced at standard cost. Actual direct labor paid for during the month has been charged to respective departments and the standard value of labor in finished production credited thereto. The further credit of the standard value of work remaining in process results in a balance in the account which is total labor variance. Of this total, as previously explained, the efficiency variance only is absolutely and currently identifiable, although the balance may be analyzed sufficiently to determine causes.

Manufacturing and Merchandising Burden

Our case Company appears to be generally orthodox in its accounting treatment of the element of cost that we so aptly term "burden." Reference to Exhibit 8 shows quite clearly how the budgeted amounts for manufacturing expenses are first spread on the bases of floor space, equipment valuation, horsepower and so on, to the direct manufacturing departments and the service departments and then the redistribution of service departments to the manufacturing departments which they serve.

Manufacturing burden rates are expressed in terms of the percentage which the budget for each department bears to the respective direct labor. This method, in view of the uniform base rate of compensation, appears fair.

Manufacturing burden rates are established on the basis of a capacity, which is estimated to be consistently attainable volume, if the Company merely obtains that which it considers to be its share of available business.

The accounting for manufacturing burden is as follows: The total of all manufacturing expenses for the month is credited to a burden clearing account and debited to an account called "Manufacturing Expenses Incurred," both carried under the accrued items section in the general ledger. An amount representing one-twelfth of the annual budget for manufacturing expenses is then credited to this account, manufacturing expenses incurred, and debited to work-in-process account. For purposes of Exhibit 7, such total budget is broken into the component departmental budgets which become the actual charges appearing in column 2 of that exhibit as "Manufacturing Overhead—Actual" for the month.

ADJUSTMENTS OF STANDARD COSTS FOR PRODUCTIVE LABOR AND MANUFACTURING OVERHEAD

for the month of.....193

PRODUCTIVE LABOR

Department	*In Process Beginning of Month Actual*	*Actual Charge for Month*	*Total*	*Consumed in Production— Standard Basis*	*In Process End of Month Standard Basis*	*In Process End of Month Actual*	*Standard Over or Under i.e. Overabsorbed or Unabsorbed*
Wax-Moulding							
-Packing							
Total							
Dustless-Moulding							
-Packing							
Total							
Chalk-Moulding							
-Packing							
Total							
Modeline							
Grand Total							

MANUFACTURING OVERHEAD

Wax-Moulding							
-Packing							
Total							
Dustless-Moulding							
-Packing							
Total							
Chalk-Moulding							
-Packing							
Total							
Modeline							
Grand Total							

EXHIBIT 7

MANUFACTURING
DEPARTMENTAL BUDGET AND BURDEN RATES

Item	Total Budget	BUDGET—PRODUCTIVE DEPARTMENTS: Wax Mldg.	Wax Packing	Stand. Mldg.	Chalk Packing	Dustless Chalk Mldg.	Dustless Chalk Packing	Model's. Clay	Printing	Total Prod. Depts.	BUDGET—NON-PRODUCTIVE DEPARTMENTS: Heat and Power	General Burden	Rec'g and Shipping	Idle Space and Machinery	Total Non-Prod. Depts.	Basis of Distribution
Superintendent	—											—				To General Burden
Supervisors	—	—	—	—	—	—	—	—	—	—	—		—		—	Experience
Indirect Labor	—										—	—	—		—	"
Fuel	—										—				—	To Heat and Power
Purchased Power	—										—				—	" " " "
Water	—										—				—	" " " "
Supplies	—											—			—	To General Burden
Freight in												—			—	" " "
Repairs—Buildings	—	—	—	—	—	—	—	—	—	—	—	—	—		—	Floor Area
" Machinery	—	—	—	—	—	—	—	—	—	—	—	—			—	Machinery Age & Valuation
Experimental Expenses	—											—			—	To General Burden
Electros	—								—	—						To Printing
Taxes	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Property Taxes—Departmental Valuation, Social Security—Factory Payroll
Insurance	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(Buildings)—Floor Area
Depreciation	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(Machinery and Equipment)—Value
TOTALS—ALL DEPARTMENTS	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	(Electric Power)—Weighted Horsepower
Heat and Power	—	—	—	—	—	—	—	—	—	—	(—)					(Electric Light)—Weighted Watts
																(Steam)—Consumption based on test
Gen. Burden and Rec'g and Shipping	—	—	—	—	—	—	—	—	—	—		(—)	(—)			Payroll of Productive Departments
TOTAL BURDEN—PRODUCTIVE DEPARTMENTS	—	—	—	—	—	—	—	—	—	—						
TOTAL FIXED BURDEN—PRODUCTIVE DEPARTMENTS	—	—	—	—	—	—	—	—	—	—				—		
TOTAL IDLE SPACE AND MACHINERY																Shown as separate item on Profit and Loss statement
DIRECT LABOR	—	—	—	—	—	—	—	—	—	—						
BURDEN RATES	—	—	—	—	—	—	—	—	—							
FIXED BURDEN INCLUDED IN RATES	—	—	—	—	—			—	—							

EXHIBIT 8

We have seen then, that the monthly charge to the work-in-process account for manufacturing burden is an amount representing one-twelfth of the annual budget. The credit to the work-in-process account for burden included in finished product is the sum of the products of the departmental standard direct labor included therein multiplied by the respective burden rates, determined in the manner indicated by Exhibit 8.

Physical inventories of work in process priced at standard cost are used to determine definitely the amount of this element of cost charged to the account which should be charged to burden variance account.

It appears that the amount shown as variance in the last column of Exhibit 7, "Manufacturing Overhead," is not the whole story in this respect, but that the balance remaining in the manufacturing expenses incurred account as the difference between the budget for the month and the expenditures for the month, is also a part of the variance. Perhaps this latter item may be broadly identified as volume variance and the former item to which we referred (in Exhibit 7, last column) as efficiency variance, although we are more inclined to think of burden efficiency variance as the difference between burden computed on actual labor paid for and that computed on standard labor, or in other words, labor efficiency variance times the respective burden rates.

We notice that the Company's formal monthly statements contain no statement, as such, of the details of manufacturing expenses incurred, although apparently such expenses are constantly under the eye of management. It is possible that a statement in the general form outlined in Exhibit 9 may prove to be a truly useful indicator and worthy of inclusion with the formal monthly statements.

Fixed Expenses and Pricing

You will note that in summary form near the bottom of the statement appears the notation "Total Fixed Expenses," "Total Variable Expenses" and "Variable Expenses per Direct Labor Hour." You will observe later, also, that on each cost sheet there appears reference to the amount of fixed manufacturing and selling expenses included in the cost.

MANUFACTURING EXPENSES

for the month of.....193...

for the.....months ending.....

Item	*Month* 193...	*Year to date Months* 193...
Superintendent	—	—
Supervisors	—	—
Indirect Labor	—	—
Fuel	—	—
Purchased Power	—	—
Water	—	—
Supplies	—	—
Freight in	—	—
Repairs	—	—
Experimental Expense	—	—
Electros	—	—
Taxes	—	—
Insurance	—	—
Depreciation	—	—
TOTAL MANUFACTURING EXPENSES	—	—
Deduct:		
FIXED EXPENSES	—	—
VARIABLE EXPENSES	—	—
DIRECT LABOR HOURS	—	—
VARIABLE EXPENSES PER D. L. HOUR		
This month	—	
This period	—	
Last month	—	
Same month last year	—	
Same period last year	—	

EXHIBIT 9

It is, of course, because of the fixed element of a company's operating expenses that the question arises with respect to what constitutes normal volume or the volume at which it should be assumed, for purposes of accounting, that all expenses are to be included in cost.

The Pioneer Crayon Manufacturing Co. well recognizes the necessity for visualizing its operating expenses included in their entirety in a demonstrated attainable volume of business. The

question is a fine one, though, for estimating how much more business might actually be available if the company were to spread its fixed expenses over a larger assumed volume, thereby reducing estimated unit costs, and enabling a reduction in prices. Whatever the answer to the broader question of price policy, there remains a definitely practical use for a knowledge of variable and fixed components of cost in the calculation of selling prices for closely competitive merchandise which may be obtainable in large quantities with relatively small direct expense. You are well aware, however, that even in this relatively simple company the fixed and variable burden costs of any given product are only approximations and involve a wide area of judgment and opinion.

Turning now to merchandising burden, so-called, or selling and administrative expenses, we find that in this company they comprise certain expenses such as commissions, discounts and freight, which are definitely applicable to the items in each of the major divisions of product (wax, crayon, standard chalk, dustless chalk and modeling clay). In developing merchandising burden rates for use in computing standard costs, such items of expense are so distributed to the major divisions on an assumed standard volume and other items of expense are distributed on an estimated service basis. The *ratios* of the *total* of such selling administrative expenses to the standard manufacturing cost of the respective standard volumes of sales according to major divisions of products, produce standard ratios which are used in the development of standard costs of product, Exhibit 10, and in a *statistical* comparison of actual incurred expenses with such standards as shown on the bottom of Exhibit 11.

Standard Cost Sheets

Exhibit 10 illustrates the sheet on which the various elements of standard cost are assembled to produce a standard cost of one product.

A separate cost sheet is used to assemble the details of the cost, principally with respect to materials which may enter into the production of a gross box of crayons, each containing several colors. Oftentimes as many as sixteen colors are contained in one box and as the colors used are expensive, detailed treatment of that cost factor is important.

STANDARD UNIT COST SHEET

Unit

Dept.

Article

Date Estimated

	Material	Labor	Mfg. Overhead	Total	Cost Per Unit
Materials					
Labor					
Mfg. Overhead at % Labor					
Total Cost Moulding					
Materials					
Labor					
Mfg. Overhead at % Labor					
Total Cost Packing					
Printing					
Total Mfg. Cost					
Selling and Admin. Cost % Mfg. Cost					
Commission					
Royalties					
Freight					
Total Cost					
Net Profit					
Selling Price					

EXHIBIT 10

Selling and Administrative Expenses and Other Income and Other Charges

for the month of 193 and 193

	This Year		Last Year	
	Month	Accumulated to date	Month	Accumulated to date
Selling Expenses:				
Payroll				
Advertising				
Traveling				
Commission				
Freight				
Discount				
Collection				
Bad Debts				
Total Selling Expenses				
Administration Expenses:				
Officers' Salaries				
Clerks' Salaries				
Telephone and Telegraph				
Postage				
Stationery and Supplies				
General				
Professional Services				
Taxes—State				
Total Administrative Expenses				
Total Selling and Administrative Expenses				
Other Charges:				
Interest on Notes Payable				
Total Other Charges				
Less: Other Income:				
Interest Received				
Discount on Purchases				
Total Other Income				
Other Charges (Net)				
Total Selling and Administrative and Other Charges (Net)				

APPORTIMENT BY PRODUCTS

for month of

Product	Cost of Sales—Standard Basis	Ratio to Total %	Selling, etc., Expenses apportioned thereon	Selling, etc., Expenses Per Standard Basis, viz., at . . . of Cost of Sales	Actual in excess or under Standard Basis
Wax Crayons					
Dustless Chalk					
Chalk					
Modeline					
Total					

ACCUMULATED TO DATE

Wax Crayons					
Dustless Chalk					
Chalk					
Modeline					
Total					

EXHIBIT 11

Each element of cost, i.e., material, labor and manufacturing burden, is accumulated in separate columns so that the accumulation of these elements for variance calculation may be effected easily.

Another form (not illustrated) is used for the accumulation of the details of the standard cost of boxes and labels which is transferred in summary form to Exhibit 10.

General Accounting

While the use of standards for direct labor and materials in terms of hours and pounds is not necessarily associated with accounting, and benefits accrue from the use of such standards regardless of their tie-in with the books of account, it is considered by this Company that failure to evaluate these standards in terms of dollars, to combine them with burden standards and then to utilize the standards in measurement of the expenditures for the period, is ignoring one of the most useful of measurements of the effectiveness of operation of a company. Our case Company ties in its standard costs with the general books of account as you have already learned.

Examination of the chart of account, identified as Exhibit 3, indicates the simplicity of the books of general account and the manner of tying in the standard costs. The accounts are grouped for the easy preparation of financial statements, as follows:

ASSETS:

- Current Assets
- Fixed Assets
- Reserves for Depreciation
- Deferred Assets

LIABILITIES AND CAPITAL:

- Current Liabilities
- Capital Stock
- Surplus

INCOME ACCOUNTS:

- Sales
- Cost of Sales

VARIANCE ACCOUNTS:

EXPENSE ACCOUNTS:

Manufacturing Expenses
Selling and Administrative Expenses

OTHER INCOME AND OTHER EXPENSE

It will be noted that only through (a) inventory accounts (including work-in-process), (b) variance accounts, (c) burden incurred account, and (d) cost of sales accounts, do the various summaries of cost information tie in with the general books of account.

Various analyses necessary for operating statement purposes are prepared on work sheets and thus the general books lend themselves to the easy preparation of informative financial statements and to economical routines.

Work in Process, Finished Goods, Cost of Sales and Variance Accounts

We have seen how step-by-step, the Pioneer Crayon Manufacturing Co. has developed its standard costs of products. Logically, the next phase of the narrative, is the co-ordination of the standard product costs with the general books of account and the comparison of standard values of what we have produced with what we have spent.

This involves several steps.

1. Summarizing sales at standard costs.
2. Summarizing finished product at standard costs.
3. Summarizing work in process at standard costs.
4. Accounting for variances between what we spent and the standard value of what we spent.

The essential information for the statement of operating results which we referred to for perspective at the outset of our study, is divided into four divisions, wax products, chalk products, dustless chalk products and modeling clay.

The Company's sales are analyzed (units and dollars) weekly according to these main divisions, and incidentally to products. They are then summarized for the month on prepared sheets with product identification printed thereon. Sales are totalled, the num-

ber of units of each product is extended at standard cost value and totalled, and the sales and cost of sales figures are then in readiness according to appropriate classification for the monthly statements.

The Company's detailed finished stock records are in terms of quantities only and its stock of finished goods is so arranged that a physical inventory may be and is recorded in a few hours. While this practice still continues and it is accompanied by a feeling of security not otherwise present, yet for many years the variation as between the total of the physical inventory of the finished stock and the finished stock controlling account has been negligible and it is wholly probable that such practice is now unnecessary.

The production of finished goods is summarized, from daily reports of product packed, on sheets similar to those used in analyzing sales, except that columns are provided for the summary of standard values of labor, material and burden.

The work-in-process controlling account is divided into three parts—material, labor and burden. The total of the standard cost of finished production is debited to the finished stock account and credited according to its expense elements (material, labor and burden) to the work-in-process account.

Work in process according to departments is physically inventoried and priced at standard cost according to expense elements, and the total thereof is credited to the work-in-process controlling account.

We have seen previously that the actual value of direct labor, the actual cost of materials and a provision for factory burden have all been debited to the work-in-process controlling account. The balances remaining in the account represent the variances for the month for materials, labor and burden.

Statistically, this summarized information is broken down to provide the detailed information provided by the variance statements, shown as Exhibits 6 and 7, upon which we have commented previously.

Financial Statements

We are now back to the subject of financial statements. The question that we asked ourselves about this subject is the obvious

one, "Are they sufficiently informative?" And our first answer was strictly according to an old Yankee custom: "What information should be shown?" After some discussion, we decided that to attempt to establish a standard practice in this regard was rather beyond the scope of this particular study.

We found, however, that most of the questions which ordinarily arise, the answers to which it is reasonably expected may be found in financial statements, can be answered from the general financial statements, or from the several subsidiary and statistical reports which the manager of Pioneer Crayon Manufacturing Company receives in the ordinary course of business routine.

The balance sheet shows the current composition of the Company's resources and liabilities and compares the current position with two previous dates to indicate the trend of the changes which are occurring constantly as a result of operations. Supplementing the balance sheet is the more frequent report of cash, receivables, inventories and payables, together with unfilled orders, so that thought may be given by management to the future, in order to keep the financial situation well in hand.

The profit and loss statement, showing as it does the net result with respect to the major lines of the Company's business, localizes the weak spots in the company's operations. In support of the sales and cost of sales by lines are the details by items and it is the general custom of the accountant, in presenting the general monthly statements to the manager, to accompany them with remarks in explanation of fluctuations in gross margin or other matters of importance in the operating picture.

The Company discovered, when this detail of sales and cost of sales was first presented them some years ago, that of some 120 items in one line, 20 items were producing about 75 per cent of the sales dollars and 90 per cent of the gross margin. Needless to say a judicial narrowing of the line was begun at once.

The manager and sales manager also receive from time to time an analysis of sales and cost of sales according to salesmen, with the direct cost, such as commissions, freights, discounts and traveling.

It is apparent from the statements that information with respect to factory operation and the measure of its performance in the light of standards is generally well presented.

As has been mentioned previously, the Company is constantly reaching out for more information with respect to the selling and general costs of its major lines and its staple and special merchandise.

It appears, then, that the Pioneer Crayon Manufacturing Co. already possesses a wealth of usable and useful information with respect to its operations which, in view of the management's attitude with regard to such information and the apparently limitless capacity of the accounting department in providing it, will increase as time passes.